IS 7751-2 (1985): Slide Switches, Part 2: Slide Switches, Type 1 [LITD 3: Electromechanical COmponents and Mechnical Structures for Electronic Equipment]

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IS : 7751 (Part 2) - 1985
(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR SLIDE SWITCHES

PART 2 SLIDE SWITCHES, TYPE 1

UDC 621·316·542·6 : 621·38/·39·038

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

January 1986

Indian Standard

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PART 2 SLIDE SWITCHES, TYPE 1

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Indian Standard

SPECIFICATION FOR SLIDE SWITCHES

PART 2 SLIDE SWITCHES, TYPE 1

0. FOREWORD

0.1 This Indian Standard (Part 2) was adopted by the Indian Standards Institution on 28 June 1985, after the draft finalized by the Electromechanical Components for Electronic Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This standard (Part 2) covers detail specifications for slide switches. The general requirements for slide switches are covered in IS : 7751 (Part 1)-1975*.

0.3 Some general notes on slide switches covered by this standard (Part 2) are given in Appendix A.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value shall be same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard (Part 2) covers requirements for slide switches (Type 1) with rated voltage $\leqslant$ 34 V and rated current $\leqslant$ 1A used in consumer electronics like waveband change switches in mains/transistorized-battery operated radio receivers.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in 2 of IS : 7751 (Part 1)-1975* shall apply.

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*Specification for slide switches: Part 1 General requirements and tests.
†Rules for rounding off numerical values (*revised*).

3. CLIMATIC CATEGORY

3.1 Provisions of category 3 of IS : 7751 (Part 1)-1975* shall apply.

4. MATERIALS AND WORKMANSHIP

4.1 Provisions of **4** of IS : 7751 (Part 1)-1975* shall apply.

5. MARKING

5.1 Provisions of **5** of IS : 7751 (Part 1)-1975* shall apply.

6. TESTS

6.1 Conditions for Tests — Provisions of **6.1** of IS : 7751 (Part 1)-1975* shall apply.

6.2 Classifications of Tests — Provisions of **6.2** of IS : 7751 (Part 1)-1975* shall apply.

7. REQUIREMENTS

7.1 The requirements shall be verified according to the relevant clauses of IS : 7751 (Part 1)-1975*.

7.2 The requirements for slide switches shall be as given in Table 1.

*Specification for slide switches: Part 1 General requirements and tests.

TABLE 1 REQUIREMENTS

(*Clause* 7.2)

Sl No.	Test	Conditions of Test	Requirements
(1)	(2)	(3)	(4)
	MECHANICAL		
i)	Robustness of terminations	—	There shall be no sign of mechanical damage or loosening of parts and the switch shall be mechanically operable
ii)	Tensile test	An axial load of 20 N shall be applied for 10 s	No change in contact resistance
iii)	Bending test	Two consecutive bends at 90° shall be given	No change in contact resistance
iv)	Solderability of terminations	This shall be checked by dipping the terminations in solder bath. Solder bath temperature 230° ± 10°C, duration 2 ± 0·5 s for PCB and 270 ± 10°C, 4 s for hand soldering	There shall be a good flow of solder
v)	Thermal shock	This shall be checked by touching the terminations by a soldering iron Temperature: 350° ± 10°C Duration: 3·5 ± 0·5 s	There shall be no sign of mechanical damage or loosening of parts and the switch shall be mechanically operable No change in contact resistance
vi)	Operating torque/force	Switch should be suitably mounted	8 N, *Max* 4 N, *Min*
vii)	End-stops torque/force	A force of 50 N shall be applied against stops	There shall be no sign of mechanical damage or loosening of parts and the switch shall be mechanically operable No change in contact resistance
viii)	Contact force	—	0·6 — 0·9 N

(*Continued*)

TABLE 1 REQUIREMENTS — *Contd*

Sl No.	Test	Conditions of Test	Requirements
(1)	(2)	(3)	(4)
	ELECTRICAL		
		The switch should be soldered to PCB for PB mounting type. Other switches should be suitably mounted	—
i)	Contact resistance	The switches shall be fully operated three times on no-load before measurement. The contact resistance shall then be measured across each pair of terminations at a current ⩽ 1 Amp and from a source whose open circuit voltage is ⩽ 2·5 V dc	⩽ 10 m ohm
ii)	Insulation resistance	The insulation resistance shall be measured after electrification for 1 min by a dc potential of 100 ± 15 V. The insulation resistance shall be measured between the following points:	—
		a) two adjacent terminations having minimum spacing, and	⩾ 10 000 M ohm
		b) all terminations connected together and all other exposed metal parts	⩾ 10 000 M ohm
iii)	Voltage proof (high voltage)	An ac (50 Hz) test voltage of 500 V shall be applied for one minute between the points indicated in (ii) above	No breakdown or flashover
iv)	Capacitance	The capacitance shall be measured at 1 MHz between:	
		a) individual terminations forming a part of a circuit but not in electrical contact, and	⩽ 1·5 pF
		b) individual terminations and all other terminations connected to the frame	⩽ 2 pF

v) R. F. shunt resistance	The resistance shall be measured at 1 MHz between: a) two terminations whose contacts are open, and b) one termination and all other terminations which are connected to earth	 > 2 M ohm > 2 M ohm
vi) Vibration	The switches shall be mounted and fastened rigidly to a suitable test jig. The test jig shall be vibrated in three different directions mutually perpendicular to each other, under one of the two conditions given below. A circuit with a lamp shall be connected to switch Displacement (10 g) Peak: 0·75 mm (10 g) for portable sets; 0·35 mm (5 g) for table models Approximate sweep time: 1 min Frequency range: 10-55-10 Hz Linear Number of sweep cycles in each of three directions: for portable sets — 120; for table models — 30 Approximate total time: for portable sets — 6 h; for portable models — 1·5 h	i) No visible damage ii) Maximum change in contact resistance $\leqslant \pm 50$ percent of original value No momentary switching operations during the test
vii) Bumping	The switches shall be mounted on the bump test machine and connected in a circuit as mentioned in (vi) above No. of bumps : 4 000 ± 10 Acceleration : 390 m/s² (40 g) Pulse duration : 6 ms	No momentary switching operation during test. No visible damage Maximum change in contact resistance ± 50 percent of original value

(*Continued*)

TABLE 1 REQUIREMENTS — *Contd*

Sl No.	Test	Conditions of Test					Requirements
		Temperature	Relative Humidity	Duration	Recovery Time	Characteristics to be Checked After Test	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CLIMATIC TESTS						
i)	*Climatic Sequence* This test shall be performed on the same samples in the following sequence:						
	a) Dry heat	+ 70°C ± 3°C	50 percent	16 h	0 1·5 ± 0·5 h	i) Insulation resistance i) Operating torque/force	i) > 5 000 M ohm ii) ⩽ 20 N
	b) Damp heat (cyclic) (first cycle)	+ 55° ± 2° to + 25° ± 3°C	93 ± 3 percent ⩾ 95 percent	12 + ½ h 12 + ½ h	1·5 ± 0·5 h	Visual inspection	No corrosion or mechanical deterioration or any other visible damage
	c) Cold	− 10°C		4 h	0 1·5 ± 0·5 h	i) Switch operation ii) Visual inspection	Mechanically and electrically operable No sign of deterioration

d) Damp heat (cyclic) (remaining 5 cycles)	+ 55° ± 2°C to + 25° ± 3°C	93 ± 3 percent	12 ± ½ h	1·5 ± 0·5 h	i) Insulation *R*	i) > 1 000 M ohm
					ii) Voltage proof	ii) No flashover or breakdown
					iii) Contact *R*	iii) ⩽ 10 m ohm ± 50 percent
					iv) Operating torque/force	iv) 8 N, *Max* 4 N, *Min*
					v) Visual inspection	v) No corrosion or any other visible damage
		⩾ 95 percent	12 ± ½ h	24 h	i) Insulation *R*	i) > 10 000 M ohm

		Conditions of Test						Requirement
		Temperature	Relative Humidity	Load/ Polarizing Voltage dc	Duration	Recovery Period	Characteristics to be Checked	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ii)	Damp heat (steady state)							
	Sample I	40° ± 2°C	90 – 95 percent	15 V dc between two adjacent termination having minimum spacing	21 × 24 h	1·5 ± 0·5 h	a) Insulation *R*	> 1 000 M ohm
							b) Voltage proof	No flashover or breakdown
							c) Contact *R*	Initial resistance ± 50 percent of initial resistance, subject to ⩽ 10 m ohms
							d) Visual inspection	No corrosion or any other visible damage

(*Continued*)

TABLE 1 REQUIREMENTS — *Contd*

Sl No.	Test	Conditions of Test						Requirement
		Tempet-ature	Relative Humidity	Load/ Polariz-ing Voltage dc	Duration	Recovery Period	Character-istics to be Checked	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Sample II	do	do	15 V dc between all termi-nations connected together and all other metal parts	do	do	a) Insulation *R* b) Voltage proof c) Contact *R* d) Operating force/torque	> 1 000 M ohm No flashover or breakdown Initial resistance ± 50 percent of initial resistance, subject to ⩽ 10 m ohms. 8 N, *Max* 4 N, *Min*
	Sample III	do	do	—	do	do	do	do
iii)	Rapid change of temperature (5 cycles)	+ 70°C to − 10°C	—	—	30 min; change over time < 3 min	do	a) Insulation *R* b) Voltage proof c) Contact *R* d) Visual inspection	> 1 000 M ohm No flashover or breakdown Initial resistance ± 50 percent of initial resistance, subject to ⩽ 10 m ohms No visible damage

Sl No.	Test	Test Condition	Characteristics to be Measured	Requirements
(1)	(2)	(3)	(4)	(5)
	ENDURANCE			
i)	With load	The switches shall be operated mechanically to make and break the main contacts 10 000 times for independent version and 16 000 times for interdependent version. The switch should be mounted on PCB. The frequency of switching for this test shall be between 9 to 15 complete switching cycle per minute. The test shall be carried out using a resistive circuit with 30 V(dc) and 100 mA	a) Insulation R b) Voltage proof c) Contact R d) Functional check e) Visual examination	$>$ 10 000 M ohm No flashover or breakdown $\leqslant$ 20 m ohm Mechanically and electrically operable. No objectionable crackle No damage
ii)	With temperature test (without load)	The following test shall be carried out. The switch should be mounted on PCB. The frequency of switching for this test shall be between 9 to 15 complete switching cycle per minute 8 000 times switching + storage for 72 h at 70°C + 1 000 times switching + storage for 72 h at − 10°C + 7 000 times switching	a) Insulation R b) Voltage proof c) Contact R d) Functional check e) Visual examination	$>$ 10 000 M ohm No flashover or breakdown $\leqslant$ 20 m ohm Mechanically and electrically operable. No objectionable crackle, 3 cm drop check No damage

(*Continued*)

TABLE 1 REQUIREMENTS — *Contd*

Sl No.	Test	Test Condition	Characteristics to be Measured	Requirements
(1)	(2)	(3)	(4)	(5)
iii)	With humidity test (Without load)	The following test shall be carried out. The switch shall be mounted on PC board. The frequency of switching shall be between 9 to 15 complete cycles/m 8 000 times switching + storage for 500 h under 40°C, 90-95 percent relative humidity condition + 8 000 times switching	a) Insulation R b) Voltage proof c) Contact R d) Functional check e) Visual check	$>$ 1 000 M ohm No flashover or breakdown $\leqslant$ 20 m ohm Mechanically and electrically operable. No objectionable crackle in 3 cm dropping of the set No visible damage

APPENDIX A

(*Clause* 0.3)

GENERAL NOTES ON SLIDE SWITCHES

A-1. Packaging for the switches should be such that no damage occurs to switch during transit.

A-2. It shall be possible to mount PB mounting type switches without the help of any auxiliary tools. Switches should be calibrated to the required mounting spacing.

A-3. Switches for connecting to the supply mains shall fulfil the safety requirement as specified in IS : 616-1981*.

A-4. Sequence of type approval check shall be according to Appendix B.

*Safety requirements for mains operated electronic and related apparatus for household and similar general use (*first revision*).

APPENDIX B

(*Clause* A-4)

SEQUENCE OF TYPE TESTS

(MINIMUM NO. OF SAMPLES 24)

All 24 Samples

Visual examination

Dimensions (Fig. 1)

Contact resistance

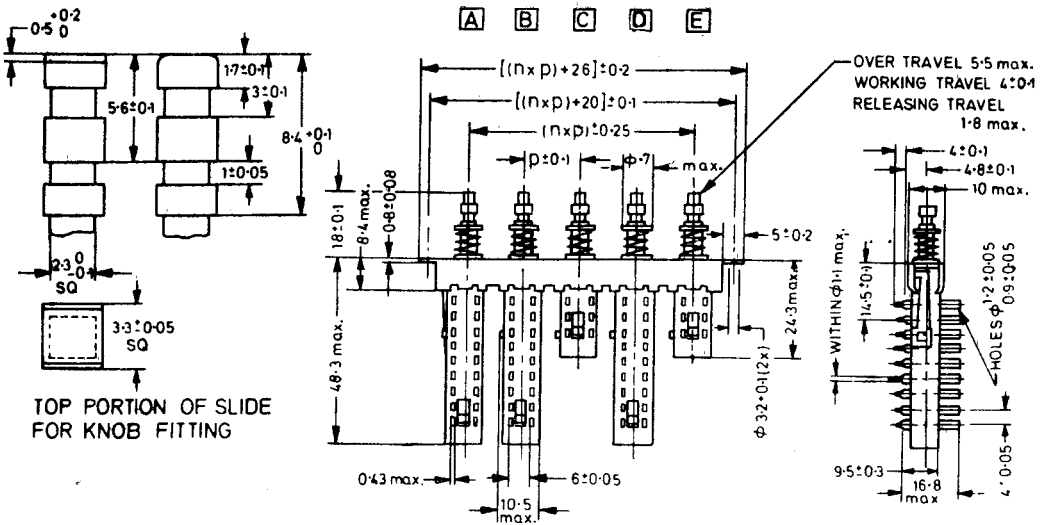
Insulation resistance

Voltage proof

Capacitance

First Lot (8 Samples)	*Second Lot* (8 Samples)	*Third Lot* (8 Samples)
Operating force	Damp heat (Steady state) 4 Samples without load	Endurance 4 Samples with load
End-stop force	2 Samples each with each load conditions	2 Samples with Temperature test
Robustness of termination		2 Samples with Humidity test
Soldering		
Vibration		
Bumping		
Rapid change of temperature		
Climatic Sequence		

Criteria for Approval — The components shall be considered to satisfy the type tests if each sample tested passes the test or tests to which it is subjected.



NOTE 1 — To prevent electrical noise likely to be caused by rubbing of metal parts on each other, the bracket should be electrically grounded.

NOTE 2 — n = M − 1.

NOTE 3 — M = 2, 3, 4 and 5.
P = 15 and 20.

FIG. 1 SLIDE SWITCH

Rejection and Re-testing — In case of failure in any one test, the requirements of type approval may be considered as not having been satisfied and fresh samples not exceeding the original number may be drawn for repeat tests. In such cases, a detailed report on the tests carried out shall be furnished. Fresh samples may be submitted after incorporation in the switches, any modification, if considered necessary. The specific test or tests to be carried out on the fresh samples shall be decided by the testing authority who may wish to carry out all the related tests whether or not the earlier samples passed these tests satisfactory. If, in the repeat test(s), no single failure occurs, the type shall be considered to be eligible for approval.